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Abstract

Development Project of a Pebble Bed Power Reactor

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By an association between EURATOM, the Kernforschungsanlage Jülich of North-Rhine Westphalia, and BROWN BOVERI/KRUPP Reaktorbau GmbH the line of pebble bed reactors initiated by the latter company is being extended towards a high-temperature reactor with Thorium-Uranium-Cycle for big power stations. The project financed by these partners and the Federal Ministry of Scientific Research of the Federal Republic of Germany is intended to investigate the fundamental problems of the application of this reactor type to large scale power production and to lead to the complete design for a 500 MW thermal prototype-reactor.

With this project the basic philosophy will be revised in the light of technical and economic feasibility. The technical progress achieved with the general development of fuel elements for gascooled high-temperature reactors has reduced the principle difficulties arising from the contamination of the primary circuit and, therefore, it seems possible to have the full benefit of high temperature and high burn-up along with good neutron economy. Major efforts of research and development will be directed tc fuel elements, irradiation and corrosion behaviour of graphite, mass transfer problems within the primary circuit, flow characteristics of a large pebble bed core, purification of the primary circuit, burn-up measurements of single balls, and neutron physics of Uranium-Thorium-Carbon-Systems. The reactor vessel, the heat exchangers and blowers, the fuel handling system, and the arrangement of these components will be studied in regard to technical performance, possible extrapolation to larger systems, and economics.

The programme provides for capsule irradiation tests of various fuel element types and reactor materials, such as graphite and steel, in the test reactors BR 2 at Mol and FRJ 2 at Jülich. The AVR-reactor at present under construction at Jülich is to be operated as a test facility to support the research and development work as well as the design effort. This will be particularly the case for fuel elements both from the operation charge and test charges resulting from further development.